Technical Seminar:
Solid Geometry Optimization and Meshing

Topics for Today:

- When You Have Technical Questions?
- Solid Geometry and Meshing Fundamentals
- Working with Solid Geometry
- Mesh like an Expert for Optimal Efficiency and Accuracy
- Mesh Repair (Everybody's Dirty Secret)
- Additional Resources

A Brief Q&A Period

April 1 2010

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When You Have Technical Questions?

- At Predictive we are your colleagues. We won't do your work for you but we will help you be a better and more knowledgeable user of Femap and NX Nastran. As one client told me "I have never had a technical support person tell me to go read the manual…"

- GTAC is online with offices on the East and West Coasts. They are good people. They won't tell you to go read the manual.

- We enjoy debugging models that won't run, odd meshing problems, idealization challenges with a new project, that is to say – engineering. Please don't expect us to train you over the phone on how to do a contact analysis or explain the differences between plate and beam elements. Again, we are your colleagues in the virtual cubical and w.r.t. training, we offer courses and have an extensive on-line library to assist you.

Solid Geometry and Meshing Fundamentals

- A geometric solid is composed of surfaces, curves and points. One can break up a solid into individual surfaces. Each surface can be decomposed into a group of curves (well somewhat) and each curve has points at its terminus. Solids can be sliced and diced and exploded and stitched and extruded, etc.

- Meshing of geometric solids is all about the meshing of individual surfaces. Think surface meshing and you will know all that you need to know about meshing geometric solids.

- When meshing fails or you have an ugly rat's nest of elements, it always has something to do with a bad surface. It is then just a quest to find these surfaces and deal with them by removing them, combining them with adjacent surfaces or rebuilding the geometry. Femap gives you almost too many options.

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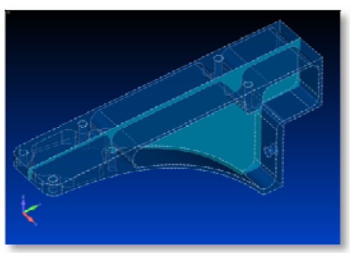
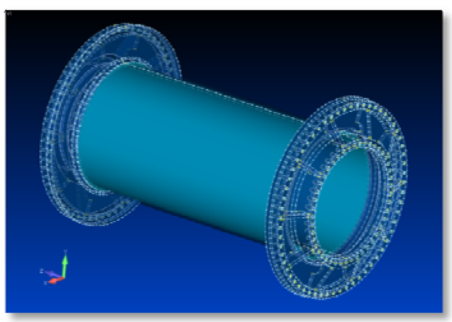
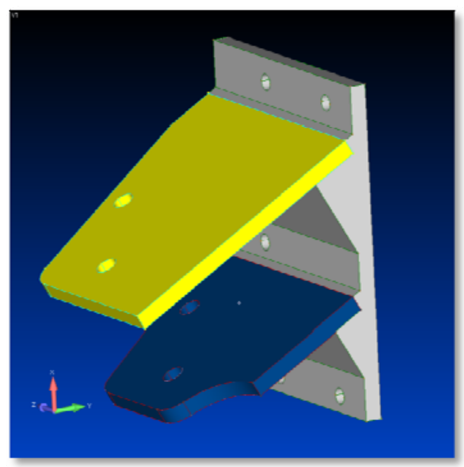
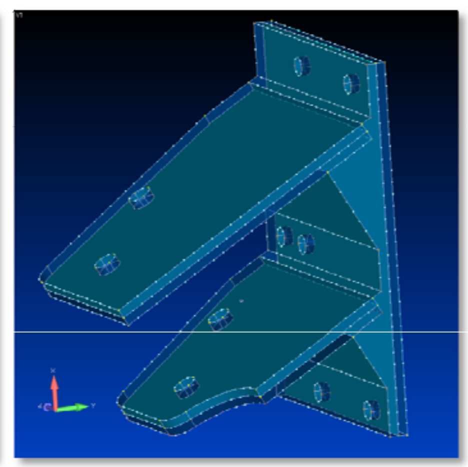
Working with Solid Geometry

- ❑ A large and complicated piece of geometry will often mesh much faster if split into smaller chunks.
- ❑ The meshing of perfectly connected geometry works through the magic of slaving surfaces together into pairs where the mesh is transfer from the master to the slave (hey – what else do you expect from a bunch of male engineers in 1970?)
- ❑ One can create better meshing with clever geometry operations.
- ❑ If the surfaces don't match you can't automatically pair'em.









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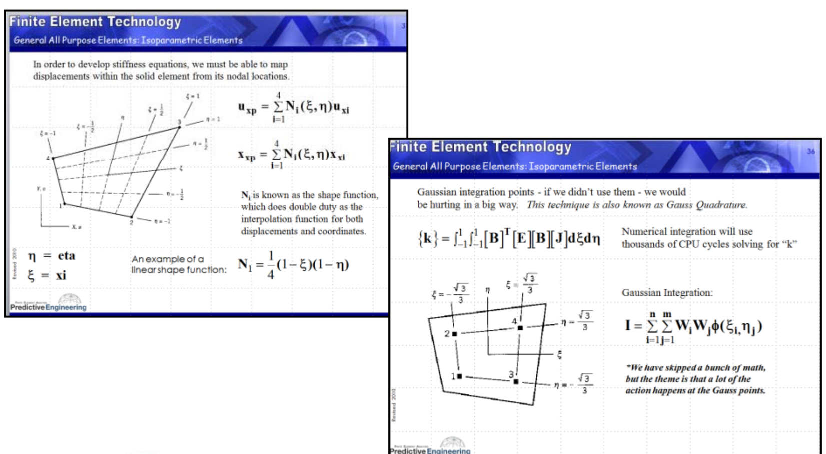
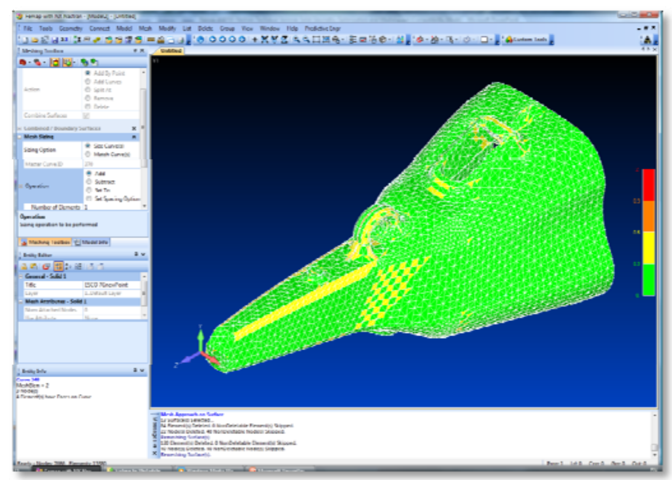
Mesh like an Expert for Optimal Efficiency and Accuracy

- ❑ Don't get into a rush when meshing a complicated part. A bit of time up front can save you hours downstream.
- ❑ A quality mesh is has substantial benefits in the quality of the analysis work and execution time. Don't believe all the fancy marketing B.S. – we are still working with isoparametric elements with basic Guassian Integration.
- ❑ Femap's meshing toolbox can do wonders and the new Mapped Mesh Feature (v10.1.1)





Finite Element Analysis
Predictive Engineering

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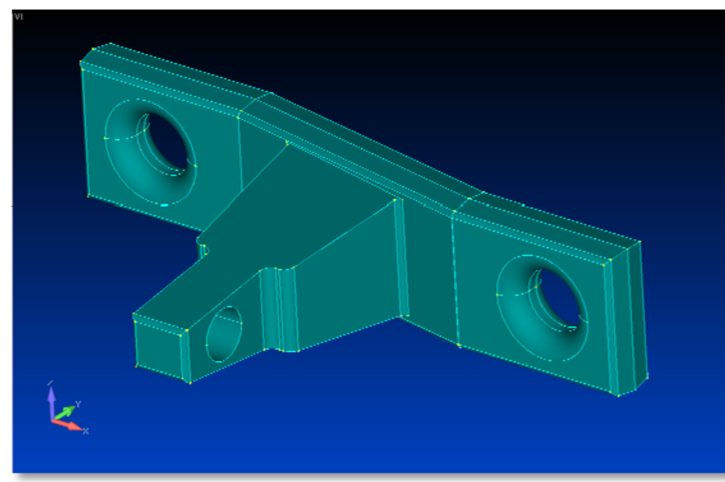
Mesh Repair (Everybody's Dirty Secret)

- ❑ One can make demonstrations all day long showing how one can mesh the impossible. The reality is that sometimes…sometimes the geometry just won't mesh. Femap can mesh anything.
- ❑ Meshing is all about meshing surfaces first, then merging along the boundary of these surfaces, checking for tightness and then submitting this mesh to the tetrahedral mesher. Every FE program uses this algorithm.
- ❑ To fix a bad mesh, find the problem and fix it.



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Additional Resources

- ❑ Femap Examples on Meshing and Mesh Repair
- ❑ Predictive Engineering Web Site.